PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 : H04H 9/00 — A1

(11) International Publication Number: WO 94/17609

(43) International Publication Date: 4 August 1994 (04.08.94)

(21) International Application Number: PCT/CA93/00012

(22) International Filing Date: 19 January 1993 (19.01.93)

(60) Parent Application or Grant
(63) Related by Continuation
US 07/732,929 (CIP)
Filed on 19 July 1991 (19.07.91)

(71)(72) Applicants and Inventors: KIEFL, John, Barrett [CA/CA]; 17 Castlethorpe Crescent, Nepean, Ontario K2G 5P6 (CA). MILTON, Arthur, David [CA/CA]; 20 Sandwell Crescent, Kanata, Ontario K2K 1V3 (CA).

(74) Agent: ADAMS, Thomas; Thomas Adams & Associates, P.O. Box 11100, Station H, Ottawa, Ontario K2H 7T8 (CA).

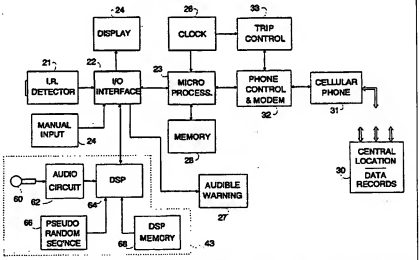
(81) Designated States: AT, AU, BR, CA, CH, CZ, DE, DK, ES, FI, GB, JP, LU, NL, NO, NZ, PT, SE, SK, UA, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.

(54) Title: TELEVISION VIEWER MONITORING SYSTEM

(57) Abstract

In a system for monitoring and collecting data on the viewing habits of television viewers or radio listeners, to enable operators of networks or television stations, programmers and advertisers to determine the numbers of viewers watching particular programs, a portable personal data collection device (16, 17, 18) comprises a detector (21, 43) for providing a station identifier identifying the particular broadcast signal being received by the receiver, a clock (26) for providing a signal representing time, a memory (28) for storing data, a cellular telephone module (31) for communicating with a central location, a control (32) for the cellular telephone module, and a microprocessor (23). The microprocessor stores in the memory data comprising the station identification, and the time at the beginning and end of receiving signals from that station. The control is arranged to control operation of the cellular telephone module to transmit the stored data to the central location. The control may respond firstly to a time signal representing a preselected time for operating the cellular telephone module to call the central location and secondly to communication being established with the central location before transmitting the data. Additionally, or alternatively, the control may respond to a call initiated from the central location to transmit the data. The data collection device may include a detector (21) for detecting a channel selection signal from a television remote control to change the station identifier stored in memory and/or a sound detector (43) for detecting a pseudo-random sequence encoded into the broadcast audio signal and decoding it to drive the station identifier and/or other information such as time of day, polling questions, and so on. Manual inputs, for example pushbuttons, may be provided for confirming that the user is actually in attendance.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	GB	United Kingdom	MR	Mauritania
AU	Australia	GE	Georgia	MW	Malawi
BB	Barbados	GN	Guinea	NE	Niger
BE	Belgium	GR	Greece	NL	Netherlands
BF	Burkina Faso	HU	Hungary	NO	Norway
BG	Bulgaria	IE	Ireland	NZ	New Zealand
BJ	Benin	IT	Italy	PL	Poland
BR	Brazil	JP	Japan	PT	Portugal
BY	Belarus	KE	Kenya	RO	Romania
CA	Canada	KG	Kyrgyzstan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo			SE	Sweden
CH	Switzerland	KR	Republic of Korea	SI	Slovenia
CI	Côte d'Ivoire	KZ	Kazakhstan	SK	Slovakia
CM	Cameroon	LI	Liechtenstein	SN	Senegal
CN	China	LK	Sri Lanka	TD	Chad
CS	Czechoslovakia	LU	Luxembourg	TG	Togo
CZ	Czech Republic	LV	Latvia	TJ	Tajikistan
DE	Germany	MC	Monaco	TT	Trinidad and Tobago
DK	Denmark	MD	Republic of Moldova	UA	Ukraine
ES	Spain	MG	Madagascar	US	United States of America
FI	Finland	ML	Mali	UZ	Uzbekistan
FR	France	MN	Mongolia	VN	Viet Nam
GA	Gabon				

TELEVISION VIEWER MONITORING SYSTEM

DESCRIPTION

TECHNICAL FIELD:

This invention relates to a system for monitoring and collecting data on audience participation and a device for use in such a system. The invention is especially, but not exclusively, applicable to a system for collecting data on a the viewing habits of television viewers and transmitting the data to a central location.

BACKGROUND ART:

It is important to networks, television stations, programmers and advertisers to determine the numbers of viewers watching particular programs. Such information could be used to determine market share and the ratings of particular programs. Since the beginning of television attempts have been made to gather information on the viewing habits of television viewers. The earlier systems were quite simple and included the keeping of a diary by a number of randomly selected viewers. These viewers were asked to enter into their diary a record of the channels viewed and the start time and end time for the viewing of each channel. Since diaries are limited to the amount of space that can be provided, viewing records are not very precise and short intervals of tuning may not even be recorded by the survey respondents. The diaries would be collected usually by mail and would take up to several weeks to process and provide the data to the people conducting the survey. This system was cumbersome and required considerable effort by the viewer selected. In addition there was a considerable time lag between the showing of a program and the determination of the results. For the system to give accurate results, it was essential that the viewer keeping the diary be able to read and comprehend fairly complex instructions as well as to know which station is being watched among the ever increasing number of stations available. The average cable TV subscriber can have 40 or more channels available, and it is increasingly

difficult to recognize channels and record them accurately in a diary. While the diary system is still in use today it is the subject of much methodological criticism, especially with the increasing amount of "junk" mail and people being more hesitant to participate in surveys.

Subsequent systems became more efficient and more complex. For example, United States Patent No. 4,566,030-Nickerson et al, issued January 21, 1986, describes a television viewer data collection system having a remote unit at each viewer location with a viewer control for each television receiver. The viewer control includes a channel selector and the viewer control is wired to either a cable converter or the television receiver and the remote unit. The remote unit includes a clock, a microprocessor and a memory. As the viewer operates the viewer control to turn on the associated television receiver and to select a channel, the time and the selected channel are stored in the memory of the remote unit. The remote unit is connected via a modem to a telephone line. At a preselected time the remote unit initiates a call to a central location and, when a connection is established, the remote unit transmits the data stored in its memory to a central location. It will be seen that this type of television data collection system is a great improvement over much earlier systems. It does not require the viewer to perform the onerous task of making repeated diary entries. It does, however, require equipment to be connected to both the television receiver (or cable converter) and a telephone line.

There are many shortcomings in this approach, as a result. The equipment and the installation of the equipment tends to be quite expensive. The system is geared only to measure viewing done in the primary residence of the persons chosen to be in the study. Because of the complexity of recruiting and installing the equipment in each household in the survey, the households are asked to participate in the research for months and on occasion for sometimes more than a year. This means there is a possibility that, among other things, the viewing data can be subjected to certain biases.

Other monitoring systems are known, for example only, the systems described in Canadian Patent No. 1,105,128-Thompson, issued July 14, 1981 and in United States Patent No. 4,107,734-Percy et al, issued August 15, 1978. These systems require connection to either the television receiver being monitored, the antenna or cable converter, or a telephone line.

US patent number 4,718,106 (Weinblatt) issued January 5, 1988 discloses a portable signal detector which responds to audible signals to record automatically the fact that the carrier of the unit is listening to the station transmitting the audible signals. The system is passive, i.e. requires no direct input from the carrier. A drawback, however, is that the device could be activated without the listener being present or paying attention to the receiver. Moreover, Weinblatt proposes to use an audible signal which could be a distraction.

DISCLOSURE OF INVENTION:

An object of the present invention is to overcome many of the foregoing problems.

According to one aspect of the invention, a portable personal data collection device, for use in monitoring audience attention to receivers for receiving broadcast signals from a number of broadcast stations, comprises

detector means for providing a station identifier identifying the particular one of said broadcast signals being received by said receiver, a clock for providing a signal representing time, a memory for storing data, a cellular telephone module for communicating with a central location, a control for said cellular telephone module, and a processor means,

said processor means being responsive to said signal representing the time and to said station identifier for storing in said memory data comprising the time at the beginning and end of receiving signals from said particular one of said broadcast stations, and the station identification,

said control serving to control operation of said cellular telephone module to transmit to said central location the said data stored in said memory.

For convenience, the term "broadcast" is used herein to embrace transmission by cable, or wireless means, including satellite and direct transmission.

The control may be responsive firstly to the time signal representing time corresponding to a preselected time for operating the cellular telephone module to call the central location and secondly to communication being established with the central location. Additionally, or alternatively, the control may be responsive to a call initiated from the central location to transmit the data.

According to another aspect of the invention, there is provided a data collection device for collecting data on the viewing activity of a person viewing a television receiver capable of being tuned to receive one of a plurality of channels, each channel representing a television signal from a respective one of a plurality of television broadcast stations, the television receiver being operable by means of a remote control for generating at least a channel selection signal. The device comprises detector means responsive to said channel selection signal for providing a station identifier, clock means for providing a time signal representing current time, manual input means for entering a confirmation signal indicating that the viewer is in attendance, processor means responsive initially to said station identifier, said confirmation signal and said clock means for recording said channel and said time signal as representing the time at which said channel was selected and the time at which said selection of said channel was discontinued, and responsive subsequently to said station identifier and said time signal to record changes in the channel to which the receiver is tuned and the times at which such changes occurred.

Preferred embodiments of the present invention provide a television viewer monitoring system that need not be wired or connected in any way to a television receiver or to a telephone line. The physical equipment itself consists of a

small data collection device that is wireless and portable. It can be carried about the household or elsewhere to record viewing that takes place on any television that the viewer chooses to watch. Typically, all persons in a household chosen to participate in a research or survey would be provided with a separate data collection device. The present invention needs only a minimum of attention by the viewer and consequently encourages viewer participation. In addition, it is able to provide individual records. That is, the system of the invention is able to record individually the viewing habits of two or more viewers who watch the same television receiver and transmit the individual records to a central location.

Embodiments of the present invention can monitor viewing of television receivers whether in the primary residence, a second residence, another household, or in a public place. A viewer can enter the channel being watched with a pushbutton channel input. For those television receivers with an infrared type of remote control, the viewer is not required to enter the channel being watched. The personal data meter will have an infrared detector similar to that of the television receiver and responsive to the remote control of the television receiver. The personal data meter may have a display which shows, at least, the channel number the personal data meter is recording.

The personal data meter may also include an "O.K." or confirmation button. Each time the television receiver is turned on, the viewer turns on the personal data meter and confirms they are in attendance by setting the channel, which is shown on the display, to the same channel as the channel to which the television set is tuned. If the channel number is already the same as the number of the channel to which the television receiver is tuned, the viewer may press the "O.K." button, thereby confirming they are in attendance. If after a specific time, for example, three or four minutes, the viewer does not confirm attendance as indicated above, then the personal data meter would be programmed to shut off.

If the television receiver is responsive to an infrared type remote control which can turn on the television receiver, then the personal data meter could also be responsive to the remote control and be turned on by the remote control, in much the same way that a cable converter operates. The viewer or respondent would still have to confirm attendance by either setting the channel on the personal data meter or by pressing the "O.K." button. In this case, the personal data meter may also be programmed to turn off after three or four minutes and preferably also programmed so that for a period of several hours it could only be turned on manually. If the remote control has a mute button, the personal data meter can be arranged to respond to that also. A record of any muting may be valuable to the people recording viewer habits.

Once attendance has been confirmed, the viewer has nothing further to do. As the viewer operates the remote control to change channels, the personal data meter also responds to the remote control to change the channel setting it has set into it. The personal data meter records the time of each channel change and the channel involved. At a predetermined time set into the program of the personal data meter, the personal data meter will actuate the cellular telephone module and call a central location. Alternatively, a central location might access the personal data meter by telephone. When a connection is established, the personal data meter will transmit the data stored in its memory. Thus, embodiments of the invention may provide a system that records the viewing habits of one or more viewers watching the same television receiver and which transmits the recorded information automatically to a central location.

Embodiments of the invention may also provide a monitoring system for listeners to radio receivers which requires no connection to a telephone line.

Thus, according to a further aspect of the invention, there is provided a system for monitoring the tuning of receivers for receiving broadcast signals from a selected one of a number of broadcast stations, comprising a personal data meter for each person using one of the receivers, each

personal data meter having a cellular telephone module, a control for the cellular telephone module, a clock providing a signal representing the time, a memory, and a means for identifying the particular one of the broadcast stations being received by the receiver, the memory being responsive to the signal representing the time and to the means for identifying the particular one of the broadcast stations being received for storing data on the time at the beginning and end, respectively, of receiving signals from the particular one of the broadcast stations, the control for the cellular telephone module being responsive firstly to a signal from the clock representing a preselected time for calling a preselected number for a central location for receiving data and secondly to a connection being made with the central location for transmitting to the central location the stored data.

The person meter may be responsive to an inaudible signal transmitted with the signal from the television or radio signal. Information such as station or programme identifier, source of the broadcast, time of day, or other arbitrary data or query may be added to the signal at its source or at any suitable point prior to transmission. The person meter may be adapted to detect the information and use it appropriately. For example, the person meter may detect an identifier and compare it with the channel selected by the user, manually or via the remote control. Alternatively, the person meter may be arranged to respond to the identifier to identify the channel or program and record the viewing time without requiring other inputs except confirmation that the user is present.

In order for the information to be transmitted in conventional television or radio systems, it must be formatted in such a way that it is not removed by the various filters and does not cause interference, either with other equipment or with the viewer's or listener's enjoyment of the program. Methods of encoding identification signals into television and radio transmissions are known. For a discussion of some methods and their drawbacks, the reader is directed to US patent number 4,945,412 (Kramer) issued July 31, 1990, which

is incorporated herein by reference. Kramer's preference is to transmit subaudible preamble codes and postamble codes with a program segment of interest.

According to yet another aspect of the present invention, there is provided a method and system of encoding information into audio transmissions using a pseudo-random signal to encode the information in such a way that the energy content of the signal is spread across the audio band. The information to be transmitted is used to modulate the pseudo-random signal. The resulting modulated pseudo-random signal will be transmitted and resemble noise. The audio signal emitted by the receiver will be monitored and the modulated pseudo-random signal demodulated to extract the information.

According to still another aspect of the invention, there is provided a data collection device for use in monitoring audience attention to receivers for receiving signals from at least one transmission station, the transmitted signals having an additional signal imposed on the audio signal outside the normal audio range, said additional signal being derived by modulating a pseudo-random digital sequence with the information to be encoded, converting the modulated pseudo-random sequence to analogue tones, and mixing the tones with the transmission signal; said device comprising sound detector means for receiving an audio signal from said receiver and converting said audio signal into a digital signal, a sequence generator for generating a pseudo-random sequence corresponding to the pseudo-random digital sequence modulated with said information, and signal processor means responsive to said pseudo-random sequence for demodulating said digital signal to extract said information.

In preferred embodiments, the modulated pseudo-random signal is mixed with the regular programme material at a level that is about 20 to 30 dB below the signal level of the regular program material, yet about 3 to 5 dB above the noise floor of the transmission path.

BRIEF DESCRIPTION OF DRAWINGS:

Embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a block diagram of a system according to the invention showing an arrangement at a remote viewer location;

Figure 2 is a block diagram showing a personal data meter for recording and transmitting to a central location data on a television viewer's habits;

Figure 3 is a front view of a typical personal data meter;

Figure 4 is a block diagram showing a system responding to an additional signal from the television station;

Figure 5 is a block diagram of a personal data meter which is capable of responding to information encoded into inaudible signals transmitted with the audio signal;

Figure 6 is a block diagram of equipment for encoding the information to be transmitted inaudibly; and

Figure 7 is a flowchart illustrating personal data meter activity;

Figure 8 is a block diagram showing a personal data meter suitable for recording and transmitting to a central location data on a radio listener's habits; and

Figure 9 is a front view of a personal data meter suitable for recording and transmitting data on a radio listener's habits.

BEST MODE(S) FOR CARRYING OUT THE INVENTION:

Referring now to the drawings, some of the preferred embodiments of the invention are described in detail below.

Referring first to Figure 1, there is shown in block form an arrangement, according to the invention, for recording data on a television viewer's viewing activity. An infrared type of remote control 10 for controlling, for example, channel selection in television broadcast receiver 15 is shown. This type of remote control is well known and it may control other operational features of television receiver 15 such as, for example, a mute feature which temporarily switches off the sound in the television receiver 15. The remote control 10

has channel selector means, such as push buttons 11. When a television viewer operates the push buttons 11 to select a channel, the remote control 10 emits an infrared channel selection signal represented by broken lines 12. This infrared signal is detected by an infrared responsive channel selector 14 in television receiver 15 which selects or tunes the desired channel in accordance with the viewer's operation of remote control 10. The channel selection signal may be generated by keying-in a specific channel number or by operating an "up/down" key to switch from one channel to the next.

Adjacent the television receiver 15 there are located one or more personal data meters, designated by blocks 16, 17 and 18, which comprise data collection devices for recording data on the viewing activity of respective television viewers. There is a personal data meter for each person who will be viewing a particular television receiver and three are shown (i.e. personal data meters 16, 17 and 18 having blocks labelled PM.1, PM.2 and PM.N). The personal data meters 16, 17 and 18 have no wired connection with the television receiver 15, or with the television antenna 20 or with the remote control 10. The personal data meters 16, 17 and 18 are simply placed adjacent the television receiver 15 so that each may receive any infrared signal 12 emitted by remote control 10. The personal data meters 16, 17 and 18 can be "taught", i.e. adapted to recognize the different kinds of remote control signal in common usage, in much the same way that some remote controls can be taught signals of other remote controls in a household.

Referring now to Figure 2, there is shown, in block diagram form, a personal data meter (for example, personal data meter 16). The personal data meter 16 includes an infrared detector 21 which receives the infrared signal from remote control 10 (Figure 1). The infrared detector 21 is connected to an input/output (I/O) interface 22 which includes various device drivers or circuits for interfacing input and output transducers to a microprocessor 23. When a particular desired channel is selected, the channel selection signal

received by infrared detector 21 is decoded by a channel detector (not shown) in the input/output interface 22 to provide a channel identifier signal which is then relayed to the microprocessor 23.

The I/O interface 22 is also connected to manual input circuitry 24 which includes, among other controls, a manually-operated switch for turning on the personal data meter 16. Alternatively, the interface 22 may include means for turning on the personal data meter 16 in response to the infrared signal from remote control 10 (Figure 1) which turns on the television receiver 15 (Figure 1). The viewer operates manual input 24 when television receiver 15 (Figure 1) is first turned on in order to (a) turn on the personal data meter 16 if it is not turned on by the remote control, and (b) set the channel memory device to the same channel as that to which television receiver 15 (Figure 1) is tuned. Either of these operations generates a confirmation signal to the microprocessor 23 to confirm that the viewer is actually present and paying attention. A display 25, operated by microprocessor 23 by way of a display driver in interface 22, shows the channel to which the device is set and, if desired, the current time. A clock 26 provides a time signal to microprocessor 23.

An audible warning device 27, such as a buzzer, controlled by microprocessor 23, is actuated if, for example, the manual input 24 is operated to set into processor 23 a channel number that is incomplete or non-existent. The audible warning device 27 may also sound if the personal data meter has detected that the television remote control has been operated and the personal data meter has not been initialized, and the viewer's presence confirmed, within a predetermined length of time.

The viewer need only turn on the personal data meter 16 and set the channel when the television receiver 15 (Figure 1) is first turned on. Any subsequent channel changes made using remote control 10 (Figure 1) will automatically be detected by the personal data meter 16 in response to the same

infrared signal that changes the channel in the television receiver.

Preferably the personal data meter 16 is powered by a battery (not shown) so that there need be no connections required when it is in use, not even to the household AC supply.

The channel detector in interface 22 provides a signal to microprocessor 23 representing the channel of record and microprocessor 23 stores the information in a location in a memory 28, together with data on the beginning time and end time at which the channel was selected by remote control 10 (Figure 1) or, initially, by manual input to the personal data meter 16 if, for example, the television is already operating when the viewer enters the room. However, to avoid recording times for each channel selected when a viewer is scanning through a number of channels, it is desirable not to provide a record of channels selected for less than a preset short time, say for example, five seconds or less. With this exception, the data is stored in memory 28.

Preferably, once a day, at a preselected time when it is unlikely there will be much television viewing being recorded, for example between 2 a.m. and 6 a.m., the data recorded in memory 28 is transmitted to a central location 30. Each personal data meter 16 has a cellular telephone module 31 with a cellular telephone control and modem 32. A trip control 33 is actuated by a time signal derived from clock 26 and representing a preselected time to transmit data. The trip control 33, in turn, actuates cellular telephone control and modem 32. The cellular phone control 32 controls the cellular telephone module 31 and calls a preset number for central location 30. When communication is established with central location 30, the cellular phone control 32 causes microprocessor 23 to access memory 28 and pass the data stored in memory 28 to cellular phone control and modem 32 and cellular telephone module 31 to central location 30. The data is automatically stored at central location 30. The data from each personal data meter is identified by an identification number associated with that personal data meter and

transmitted with the data. When the data has been satisfactorily transferred to the central location 30, a signal from the central location 30 causes microprocessor 23 to clear memory 28 for the storing of new data. If communication is not established with the central location 30, the cellular telephone control 32 will try again after a predetermined interval to establish communication.

The time required for a personal data meter to transfer data is relatively short. A typical calling procedure might take of the order of 20 seconds with a few more seconds to ensure that satisfactory communication has been established. Transfer of, say, one kilobyte of data, stored in memory 28 to central location 30 might take of the order of 4 to 5 seconds (2400 baud). Thus a time of 30 seconds might be involved in a typical transfer. There may be more data stored in memory 28 and more time may be required. For example, there may be almost continuous television operation by a viewer with many channel changes. Also, muting of the television sound output by operation of the remote control may be detected by the interface 22 and the information recorded and transmitted along with the channel data. However, in most cases the time will not exceed 60 seconds and it is rarely expected to exceed two minutes. Thus, the trip controls for each of the personal data meters might be set to initiate calling one minute apart. For each number available at the central location there could be 60 transfers of data per hour. Limited opportunity for re-dialling when communication is not established on the first try, is provided by either extending the time period for each transfer or by providing a re-dialling window at the end of the transfers. The trip control 33 is set for re-dialling accordingly.

It will be seen that if there are two personal data meters at a television receiver, each associated with an individual viewer, the first individual turns on the television receiver, turns on the personal data meter assigned to that individual, and sets the appropriate starting channel into the personal data meter. The second individual, who may start viewing after the first but while the first individual

is still viewing, turns on the personal data meter assigned to that individual, and sets into that personal data meter the channel currently being watched.

The audible warning device 27 is connected to microprocessor 23. If there have been no changes in the channel selector 14 in a long time, for example four hours, the audible warning device 27 is actuated. If the viewer is present, the viewer may terminate the audible warning by re-entering the number of the channel being watched either manually or by an infrared remote control or by pressing an "OK" button. If the viewer is not present or takes no action, the audible warning will continue to sound for a preset time, for example 30 seconds, and then the microprocessor 23 will turn off the personal data meter.

Referring now to Figure 3, there is shown a front view of a typical personal data meter, for example personal data meter 16 (Figures 1 and 2). The display 25 comprises one side to display time and one side to display the current channel number. Push buttons 35 for channel selection, 36 for on/off switching and 37 for an "OK" button, form the manual input means 24 (Figure 2). An infrared light receiver 38 of infrared detector 21 (Figure 2) receives and responds to infrared light from a remote control. A name sticker 39 is used to identify the individual to whom the personal data meter is assigned. In order to record data pertaining to the watching of video tapes or the playing of video games, it is desirable to set aside particular channel numbers for each of these activities.

Referring now to Figure 4, another embodiment of the invention is shown. A television transmitter 40 broadcasts a television signal via transmitting antenna 41. In this instance the television broadcast signal will include an additional signal on the sound carrier as will be described. The television broadcast signal is received by the television antenna 20A coupled to a television receiver 15A having the usual speaker 42. A personal data meter 16A is shown with its associated display 25A, a manual input 24A, and audible warning device 27A shown separated. As before, the television

receiver 15A is responsive to an infrared signal (represented by broken lines 12A) from a remote control 10A to turn on the television receiver 15A and to tune the television receiver 15A to desired channels. Also, as before, the personal data meter 16A is responsive to the same infrared signal from remote control 10A to turn on personal data meter 16A and to change the channel numbers recorded by personal data meter 16A in accordance with the channels selected on television receiver 15A. Also, as before, the personal data meter 16A has a manual input 24A which is used when the personal data meter is turned on to either set the channel number indicated on display 25A to be the same as the channel to which television receiver 15A is tuned, or establish that the channel number is correct. An audible warning device 27A is also shown.

The personal data meter 16A has, in addition, a sound responsive device or sound detector 43. There is an additional signal introduced onto the sound carrier by the television broadcast transmitter or television station 40. This additional signal is conveniently just outside the audible range, conveniently a sub-audio signal. This additional signal may be continuous or may be transmitted when desired. This additional signal will be generated from speaker 42 on television receiver 15A and will be received by sound detector 43. If, for example, the television receiver is turned on but the personal data meter has, for some reason, not been turned on, personal data meter 16A will be turned on by this signal and the audible warning 27A will sound. If desired, display 25A may also be caused to flash. The viewer must respond with an appropriate input at manual input 24A. If there is no response confirming the presence of the viewer, the personal data meter is programmed to turn off after a short interval and would not be again activated by this additional signal for a period of several hours. While the inaudible signal could be a short burst or take one of the forms disclosed by Weinblatt, *supra,* and by Kramer, *supra,* for example, preferred embodiments of the present invention employ spread spectrum techniques.

Figure 5 shows a personal data meter 16B similar to that shown in Figure 2 and which is capable of responding to inaudible signals encoded into the transmitted audio using spread-spectrum or "frequency hop" techniques. Before the personal data meter 16B is described, however, encoding of the information into the transmitted audio will be described. As shown in Figure 6, a modulation encoder 50 combines the programme and/or station identifier and/or other information to be transmitted to the personal data meter, referred to hereafter as "data", with an internal 20 bits/second clock signal to provide clocked data. For simply monitoring what is being viewed, the information to be transmitted may comprise a station identifier and time-of-day signal. Of course, other arbitrary information may be transmitted, perhaps to identify the programme or broadcaster, or to pose questions to the user about the program content. Typically, the amount of information is quite small, of the order of 10 to 200 bits for a unique station identifier and time-of-day. Other fields could be appended as required.

A pseudo-random sequence generator 52 supplies a 20 bits/second pseudo-random digital sequence to modulation encoder 52, which combines it with the clocked data to provide a modulated pseudo-random digital signal which it supplies to audio circuit 54. The modulated pseudo-random digital signal comprises 8 bit words at the rate of 20 words per second. Hence, the words change pseudo-randomly 20 times per second.

The modulated pseudo-random signal is converted into analogue tones by audio circuit 54 which may conveniently comprise an audio accessory card for personal computers, such as that marketed under the trade mark SOUND BLASTER, which include, among other things, an analogue-to-digital converter and the capability of generating up to 256 tones selected by individual ones of the 8 bit words from modulation encoder 50. Hence, 20 times per second, the selected tone will change between discrete values which vary pseudo-randomly. The audio circuit supplies the audio tones a mixer 56 which mixes them with the program audio for broadcast to provide the audio signal to be transmitted. As shown in Figure 6, the audio

signal may be passed directly to the transmitter, or recorded for later transmission.

The tones are mixed at a level which is about 20 to 30 dB belcw the signal level of the regular program material yet about 3 to 5 dB above the noise floor of the broadcast channel. Because the information is modulated onto the pseudo-random signal, its energy is distributed across the audio range. As a result, the information can coexist in the audio portion of the transmitted signal spectrum yet will not be audible and will not detract from the general audio quality of the transmitted signal.

The coded information is transmitted periodically. The period is determined according to the needs of the measuring organization. The repetition rate is determined by the number of bits and the bit rate. In practice, it will typically be in the range of 2 sec. to 15 minutes. This requirement gives quite low bit rates.

Because the encoded signal is maintained in the audio band of the regular broadcast channel, it will travel from the transmitter to the receiver and be emitted from the loudspeaker in the usual way. Referring again to Figure 5, the sound responsive device 43 comprises a microphone 60 connected by way of an audio circuit 62 to a digital signal processor (DSP) 64. A pseudo-random sequence generator 66 and memory device 68 are shown as separate items connected to the DSP 64. In a practical device, the memory 68 would probably be integral and the pseudo-random sequence would be generated in the DSP 64 using software. In fact, it is likely that, in practice, the DSP 64 and microprocessor 23 will be combined into one device. The audio circuit 62 also may comprise an audio accessory card for personal computers, such as that marketed under the trade mark SOUND BLASTER, and include, among other things, an analogue-to-digital converter. Other parts of the personal data meter 16B will not be described in detail since they correspond to those in Figure 2 and have the same reference numbers.

The audio signal from the receiver's loudspeaker 42 (Figure 4) will be received by microphone 60, converted to a

digital bit stream by audio circuit 62 and passed to DSP 64. The bit stream comprises a series of 8 bit words oversampled at 8 kHz. The DSP 64 repeatedly performs Fast Fourier analysis upon the bit stream to determine the energy content in various predetermined bands within the audio range. The bands correspond to the set of frequencies used in encoding the information as described earlier. The DSP 64 stores the results of the Fast Fourier analysis in its memory 68 for subsequent correlation with the known pseudo-random sequence from generator 66. The pseudo-random sequence will repeat after a predetermined interval. It is not necessary to store results for the entire interval. Enough results should be stored to allow sufficient confidence, statistically, in the correlation performed between the samples and the known pseudo-random sequence. When a sufficiently high correlation factor is achieved, which need not necessarily be unity, the DSP 64 locks onto data, in particular the transitions between frequencies, and acquires the clock signal embedded. It then extracts the data transmitted in the audio signal and passes it to the I/O interface 22. Such methods of decoding spread spectrum codes are well described in the technical literature and will not be described further here.

Where appropriate, before transmitting the data to I/O interface 22, the DSP 64 uses the information to access memory device 68. For example, if the information is a station identifier, the DSP 64 will determine from memory 68 the particular station and supply it, with the time of day, to microprocessor 26 by way of I/O interface 22.

The DSP 64 may also monitor the average level of the audio signal, as contained in the Fast Fourier analysis. This average level can be used to determine, for example, whether or not the sound has been muted. (see steps 75 and 76 of Figure 7.)

The decoded information is used by the microprocessor 23 along with other information about the environment to determine what information to save for broadcast measurement purposes. This would normally take the form of a decision tree, where inputs from the keyboard, audio source (level and

information) are combined to determine if the viewer is still watching the same program. Figures 7A and 7B are a flowchart depicting such a decision process. Referring to 7A, the sample sequence begins with step 71 in which the microprocessor 23 monitors continuously the I/O interface 22 to detect the station ID and transmitted time. In step 72, the microprocessor 23 compares the detected station ID and transmitted time with those previous entered in memory 28. If the station I/D has changed, in step 73 microprocessor 23 records the new station ID and the time it was received in memory 28. In step 74 the microprocessor 23 records the internal time from its own internal clock together with particulars of any event which caused the change, for example operation of one of the manual input push buttons or the infra-red control, or any other event that the person meter is capable of detecting. This data is recorded along with the station ID and the transmitted time in memory 28. Recordal of the two times i.e. that transmitted with the audio signal and that internal to the microprocessor 23, makes it possible to determine whether or not the program is being viewed or listened to at the time of transmission or later, i.e. after recording. Also it enables the transmission time of commercials to be confirmed. If necessary, some of the data will not be recorded in memory or will be erased from memory in order to limit the amount of memory capacity required. The microprocessor 23 will then return to step 71 and assume its monitoring or waiting mode. If in step 72 the microprocessor 23 determines that the station ID is the same as previously entered in memory 28, i.e. the result of decision step 72 is negative, in step 75 the microprocessor 23 takes the audio level from I/O interface 22, as detected via the sound detector circuit 43, and in step 76 compares it with the audio level previously recorded. If there has been no change in audio level, the microprocessor 23 returns to step 72. If, however, the audio level has changed, in step 77 the microprocessor 23 seeks to determine the cause. Thus, in step 77 it gets the infra-red information from IR detector 21 and analyses it to determine whether or not it signifies that the

change is due to operation of one of the remote control keys. If so, and decision step 78 is positive, the microprocessor 23 returns to step 73 and records station ID, received time and the internal time. More importantly, in step 74 the microprocessor 23 records the causal event as being operation of the remote control.

If decision step 78 indicates that the remote control was not operated, in step 79 the microprocessor 23 scans the personal data meter's keyboard push buttons and in step 80 determines whether or not one of the keys has been depressed signifying either a user request or perhaps a response to a question or prompt from the receiver. If one of the keys has been operated, and the result of decision step 80 is positive, in step 81 the microprocessor 23 determines the key depressed and the time and in step 82 forms an event record. It then returns via loop 83 to step 73 and records the event and time etc. in memory 28.

If no key has been depressed, and the result of decision step 80 is negative, the microprocessor 23 scans its internal timed event information in step 84. Timed event information is stored in program memory within the microprocessor 23, typically before it is issued to the user, though it could be downloaded from central location 30 or entered manually. The timed event information will include, for example certain questions to be asked at certain times, and the time at which the records are to be transmitted to the central location. Thus in decision step 86 the microprocessor 23 will determine whether or not it is time for the user to be asked a question about the program being viewed, and if, so display the question on the display 25. At the same time, in step 88 it may activate the audio warning device 27 to draw the user's attention to the displayed question. In step 89, the microprocessor 23 monitors the pushbuttons and determines which ones are operated in answer to the question. It then returns via loop 83 to step 73 to record the resulting information in memory 28 by way of step 73 and 74.

Although not specifically shown in Figure 7B, decision step 86 will be followed by a further decision step which will

determine whether or not the timed event is a call for the personal data meter to transmit the contents of memory 28 to the central location 30. If it is, the microprocessor 23 will initiate a transmission as previously described.

The sound responsive device 43 could be built into the person meter using a small DSP which is commercially available, which would simplify transfer of information from the DSP. If desired, however, the DSP could be separate from the person meter and connected by a suitable communication channel, for example an infra-red link.

It is also envisaged that a personal person meter embodying the invention could dispense with the infra-red detector and rely only upon detection of the pseudo-random coded audio signal to determine channel selection, with the user merely inputting whatever response is required, such as confirmation of his/her presence, answers to questions, and so on, by way of the pushbuttons.

It should be appreciated that the information to be encoded could be injected into the audio signal at various points in the transmission system, including when the program material is being created. In the latter case, a programme or source identifier may be used instead of a station identifier. Also, although a television transmitter and receiver are shown, the technique could be applied to radio systems.

Embodiments of the invention using pseudo-random coding of monitoring information as described with reference to Figures 5 and 6 are not limited to portable data collection devices. The pseudo-random coding technique could be applied also to fixed or hard-wired data collection devices for audience monitoring. The technique could also be used to monitor programme material, including commercials, using fixed or portable monitoring devices, with no audience input.

Referring now to Figure 8, there is shown in block form a personal data meter 16A suitable for monitoring the listening habits of a radio listener. Because there is normally no infrared remote control for the average radio, the radio listener is required to do more than the television

viewer. The personal data meter 16A is placed conveniently near the radio used by the listener involved in the monitoring. When the listener turns on the radio, the listener must also turn on the personal data meter 16A and select the same radio station on the channel select memory 45 as that to which the radio is tuned. This selection is made by depressing an appropriate one of the push buttons 46. The push button 46 that is depressed is labelled with the call letters of the radio station, and the display 25A may show the call letters of the station, the operating frequency and any other desired information. Audible warning device 27A is actuated if the listener forgets to depress one of the push buttons 46.

It will be seen that whenever the listener wishes to listen to another station, the listener must not only tune the radio receiver to the desired station but must also depress the appropriate one of push buttons 46.

Each of the remaining blocks representing circuitry in Figure 8 operates in the same manner as corresponding blocks in Figure 2 and it is believed no further description is required.

Figure 9 is a front perspective view of the radio personal data meter 16A whose circuitry in block form was shown in Figure 8. A name sticker 39 is used to identify the personal data meter being used by a particular individual. The display 25A shows current time and the operating condition, that is "ON" or "OFF". The push buttons 46 each represent a radio station in the listening area which could be tuned in by the listener using personal data meter 16A. There is a push button 46A that can be pushed when the listener is listening to tapes or CDs or other recordings. There is an "ON/OFF" push button 46B. There are buttons 46C, 46D and 46E which represent location, such as indoors, outdoors, automobile, for example.

The personal data meter 16A is battery powered, as are the other personal data meters described. This enables them to be carried anywhere. As long as the personal data meter is in an area where cellular telephone communication is

feasible, then the transmitting of recorded data requires no action by the listener or viewer. Unlike prior devices, no wired connections to radio, television receivers or telephone systems is required.

It is believed that the preceding description will provide a clear understanding of the invention.

An advantage of providing the data collection device with a cellular telephone module is that it permits data to be collected very promptly, enabling statistics to be compiled quickly, for example after a specific program has been transmitted. An advertising campaign could than be modified very quickly in dependence upon the feedback provided in this way. Nevertheless, it is envisaged that embodiments of the invention which respond to the remote control channel selection signal could omit the cellular telephone module. The data could retrieved some other way. Even without the cellular telephone module, such a device has advantages over other devices since it provides automatic capturing of channel changes while requiring a limited manual input to confirm the presence of the user.

It should be appreciated that the device could be modified, primarily by programming of the processor, to collect other kinds of data as well, for example audience reaction to programme or advertisement content, or public opinion polls.

INDUSTRIAL APPLICABILITY

It will be appreciated that, although the specific embodiment describes a system in which the transmitted signal is broadcast, the invention is not limited to wireless systems, whether satellite or direct transmission systems, but also comprehends cable systems.

CLAIMS:

1. A system for monitoring audience attention to television or radio transmissions, comprising at least one transmission station (40) for transmitting at least an audio signal including program material and an additional signal, said additional signal being derived by modulating a pseudo-random digital sequence with information to be encoded, converting the modulated pseudo-random sequence to analogue tones, and mixing the tones with the audio signal for transmission; said system further comprising at least one receiver for emitting an audio signal including the tones, and a data collection device, said device comprising sound detector means (60,62) for receiving an audio signal from said receiver (15) and converting said audio signal into a digital signal, a sequence generator (66) for generating a pseudo-random sequence corresponding to the pseudo-random digital sequence modulated with said information, and signal processor means (64) responsive to said pseudo-random sequence for demodulating said digital signal to extract said information.

2. A system as claimed in claim 1, wherein said tones are mixed with said audio signal at a level which is below a prescribed signal level of regular program material yet above a noise floor of the transmission path.

3. A system as claimed in claim 2, wherein the tones are at a level about 20 to 30 dB below the prescribed signal level of regular program material and about 3 to 5 dB above the noise floor.

4. A data collection device (16A) for use in monitoring audience attention to receivers for receiving signals from at least one transmission station, the transmitted signals having an additional signal imposed on the audio signal outside the normal audio range, said additional signal being derived by modulating a pseudo-random digital sequence with the information to be encoded, converting the modulated pseudo-random sequence to analogue tones, and mixing the tones with

the transmission signal; said device comprising sound detector means (43; 60,62) for receiving an audio signal from said receiver (15) and converting said audio signal into a digital signal, a sequence generator (66) for generating a pseudo-random sequence corresponding to the pseudo-random digital sequence modulated with said information, and signal processor means (64) responsive to said pseudo-random sequence for demodulating said digital signal to extract said information.

5. A device as claimed in claim 4, wherein the signal processor means (64) is operable to perform Fourier analysis repeatedly upon said digital signal to determine energy distribution in predetermined bands, and to correlate the energy distribution over a predetermined period of time with a pseudo-random sequence corresponding to that modulated by the information.

6. A device as claimed in claim 4, further comprising manual input means, said processor means being operable to detect user operation of the manual input means and to record data in dependence upon both the information and user input.

7. A device as claimed in claim 4, further comprising a cellular telephone module (31) for communicating with a central location (30) and a control (32) for said cellular telephone module, the control being operable by the processor means to operate said cellular telephone module to transmit to said central location the said data stored in said memory.

8. A device as claimed in claim 4, further comprising a detector for detecting signals from a receiver remote control, said processor means being operable to monitor said detector means and to record said data in dependence upon both the information received in the audio signal and operation of said remote control.

9. A system for monitoring audience attention to receivers for receiving broadcast signals from a number of broadcast stations, comprising

a portable personal data meter (16, 17, 18) for each person to be monitored attending to one of said receivers,

each portable personal data meter having a cellular telephone module (31) for communicating with a central location (30), a control (32) for said cellular telephone module, a clock (26) providing a signal representing time, a memory (28) for storing data, a detector means (21, 22; 43, 22) for providing a station identifier identifying the particular one of said broadcast stations being received by said receiver, and a processor means (23),

said processor means being responsive to said signal representing the time and to said station identifier for storing in said memory data comprising the time at the beginning and end of receiving signals from said particular one of said broadcast stations, and the station identification,

said control serving to control operation of said cellular telephone module to transmit to said central location the said data stored in said memory.

10. A system as claimed in claim 9, wherein said control for said cellular telephone module is responsive firstly to a signal from said clock representing a predetermined time for calling a preselected number for a central location for receiving data, and secondly to a connection being made with said central location to initiate transmission of said data.

11. A system as claimed in claim 9, wherein said control for said cellular telephone module is responsive to a request in a call initiated by said central location to transmit said data.

12. A system as claimed in claim 9, for monitoring the viewing activity of television viewers at a plurality of remote locations and transmitting data relating to the viewing

activity to a said central location, each said receiver comprising a television broadcast receiver (15) having a viewer-operated remote control (10) for generating at least a channel selection signal for selecting a desired one of said plurality of television broadcast channels, each said detector means of a said personal data meter comprising a detector (21) responsive to said channel selection signal for providing a station identifier identifying the channel to which the said television receiver is tuned, said processor unit (23) being operable to record in said memory (28) the channel identifier and period for which such channel was selected.

13. A system as claimed in claim 12, wherein each said personal data meter comprises

a manual means (24) for entering the number of the channel corresponding to the desired channel number to which said television receiver is tuned, and said processor (23) is operable to detect correspondence between the channel identified by means of the station identifier derived from the remote control signal and the channel identification entered manually and commence recording said data when they correspond.

14. A system as claimed in claim 13, wherein each said personal data meter further comprises a warning device (27) and said processor means is operable to operate the warning device if such correspondence is not detected within a predetermined time interval after the personal data meter has been turned on.

15. A system as claimed in claim 12, wherein each said personal data meter further comprises a manual input means (24, 37) operable by the user to provide a confirmation signal confirming presence and attention to the receiver, and a warning device (27), said processor means being operable to operate said warning device in the absence of such confirmation signal within a predetermined time interval.

16. A system as claimed in claim 9, in which the broadcast signal from said selected one of said broadcast stations has an additional signal imposed on the sound carrier outside the normal audio range, and in which each said personal data meter further comprises a sound detector for said additional signal, and a warning device, said processor being responsive to said additional signal for energizing said warning device requiring manual input from a respective one of said persons and, on receipt of such manual input, commencing recording of said data.

17. A data collection device for use in monitoring audience attention to receivers for receiving broadcast signals from a number of broadcast stations, said device comprising

a portable personal data meter comprising a cellular telephone module (31) for communicating with a central location, a control (32) for said cellular telephone module, a clock (26) providing a signal representing time, a memory (28) for storing data, a detector means (21, 22; 43, 22) for providing a station identifier identifying the particular one of said broadcast stations being received by said receiver, and a processor means (23),

said processor means being responsive to said signal representing the time and to said station identifier for storing in said memory data comprising the time at the beginning and end of receiving signals from said particular one of said broadcast stations, and the station identification,

said control serving to control operation of said cellular telephone module to transmit to said central location the said data stored in said memory.

18. A device as claimed in claim 17, wherein said control for said cellular telephone module is responsive firstly to a signal from said clock representing a predetermined time for calling a preselected number for a central location for receiving data, and secondly to a

connection being made with said central location to initiate transmission of said data.

19. A device as claimed in claim 17, wherein said control for said cellular telephone module is responsive to a request in a call initiated by said central location to transmit said data.

20. A device as claimed in claim 17, for monitoring the viewing of a television broadcast receiver having a viewer-operated remote control for generating at least a channel selection signal for selecting a desired one of said plurality of television broadcast channels, said device comprising a detector responsive to said channel selection signal for providing a said station identifier identifying the channel to which the said television receiver is tuned, said processor being operable to record in said memory the channel identifier and period for which such channel was selected.

21. A device as claimed in claim 20, further comprising manual input means (10, 35) for entering the number of the channel corresponding to the desired channel number to which said television receiver is tuned, and wherein said processor is operable to detect correspondence between the channel identifier derived from the remote control signal and the channel identification entered manually and commence recording said data when they correspond.

22. A device as claimed in claim 21, further comprising a warning device (27) and wherein said processor means is operable to operate the warning device if such correspondence is not detected within a predetermined time interval after the personal data meter has been turned on.

23. A device as claimed in claim 20, further comprising a manual input means (37) operable by the user to provide a confirmation signal confirming presence and attention to the receiver, and a warning device, said processor means being

operable to operate said warning device in the absence of such confirmation signal within a predetermined time interval.

24. A device as claimed in claim 17, for monitoring a receiver responsive to a broadcast signal from said selected one of said broadcast stations having an additional signal imposed on the sound carrier outside the normal audio range, said detector means comprising a sound detector for said additional signal, and a warning device, said processor being responsive to said additional signal for energizing said warning device and requiring manual input from a respective one of said persons and, on receipt of such manual input, commencing recording of said data.

25. A device as claimed in claim 17, for monitoring a receiver responsive to a broadcast signal from said selected one of said broadcast stations having an additional signal imposed on the sound carrier outside the normal audio range, wherein said additional signal comprises a pseudo-random sequence modulated with information to be communicated to the personal data meter, said detector means comprising a sound detector means for receiving audio from said receiver and converting said audio into a digital signal, a sequence generator for generating a pseudo-random sequence corresponding to the pseudo-random sequence modulated with said information, and signal processor means responsive to said pseudo-random sequence for demodulating said digital signal to extract said information.

26. A device as claimed in claim 24, for monitoring the viewing activity of a television viewer at a remote location and transmitting data relating to the viewing activity to a said central location, each said receiver comprising a television broadcast receiver (15, 15A) operable by means of a viewer-operated remote control for generating at least a channel selection signal for selecting a desired one of said plurality of television broadcast channels, said detector

means in said device being responsive to said channel selection signal for providing said station identifier.

27. A data collection device for collecting data on the viewing habits of a person viewing a television receiver (15, 15A) capable of being tuned to receive one of a plurality of channels, each channel representing a television signal from a respective one of a plurality of television broadcast stations, the television receiver being operable by means of a remote control (10, 10A) for generating at least a channel selection signal, the device comprising

detector means (21) responsive to said channel selection signal for providing a station identifier,

clock means (26) for providing a time signal representing current time,

manual input means (24) for entering a confirmation signal indicating that the viewer is in attendance,

processor means (23) responsive initially to said station identifier, said confirmation signal and said clock means for recording said channel and said time signal as representing the time at which said channel was selected and the time at which said selection of said channel was discontinued, and responsive subsequently to said station identifier and said time signal to record changes in the channel to which the receiver is tuned and the times at which such changes occurred.

28. A device as claimed in claim 27, further comprising audible warning signal generating means (27) operable in the event that said confirmation signal is not received within a predetermined time elapsed from initial channel selection.

29. A data collection device for collecting data on the listening habits of a person using said data collection device and listening to one of a plurality of radio signal broadcasting stations, and for transmitting collected data to a central location, comprising

means (46) for receiving a manual input representing said one of a plurality of broadcasting stations and providing a signal representing the respective broadcast station,

a clock means (26A) for providing a time signal,

memory means (28A),

a processor (23A) for receiving said time signal and said signal representing the respective broadcast station and storing in said memory means data representing the start time and the stop time for listening to said respective broadcast station,

a cellular telephone module (31A), and

a control (32A) for said cellular telephone module, said control being operable to cause the cellular telephone module to transmit to said central location the said data stored in said memory.

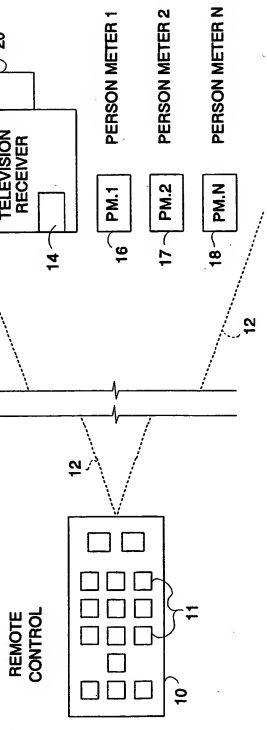

20
15
TELEVISION RECEIVER
14
PERSON METER 1
PERSON METER 2
PERSON METER N
PM.1
PM.2
PM.N
16
17
18
12
12
REMOTE CONTROL
11
10

FIG. 1

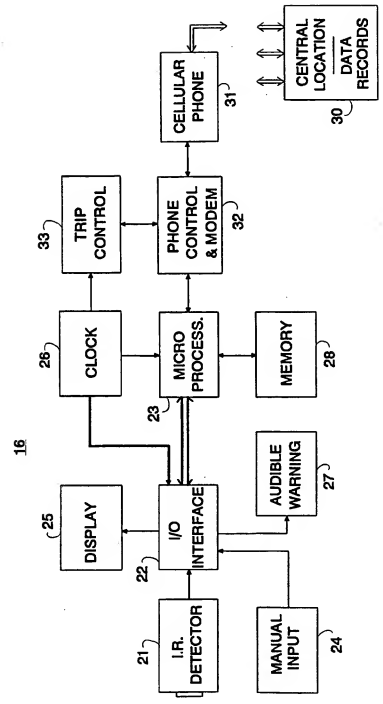

16
I.R. DETECTOR
21
MANUAL INPUT
24
I/O INTERFACE
22
DISPLAY
25
AUDIBLE WARNING
27
MICRO PROCESS.
23
MEMORY
28
CLOCK
26
TRIP CONTROL
33
PHONE CONTROL & MODEM
32
CELLULAR PHONE
31
CENTRAL LOCATION
DATA RECORDS
30

FIG. 2

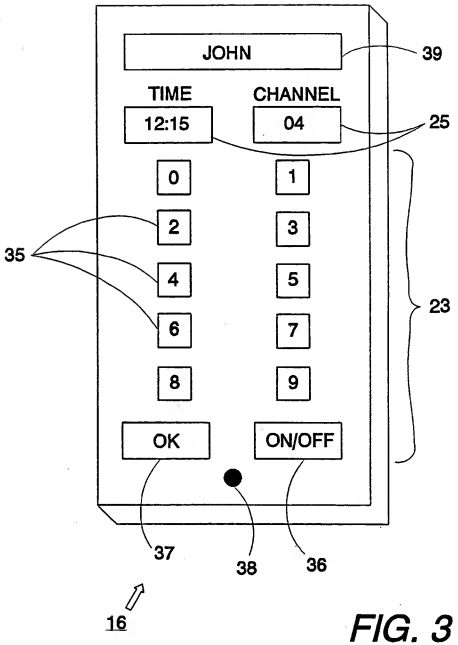

JOHN
39
TIME
CHANNEL
12:15
04
25
0
1
2
3
35
4
5
6
7
23
8
9
OK
ON/OFF
37
38
36
16

FIG. 3

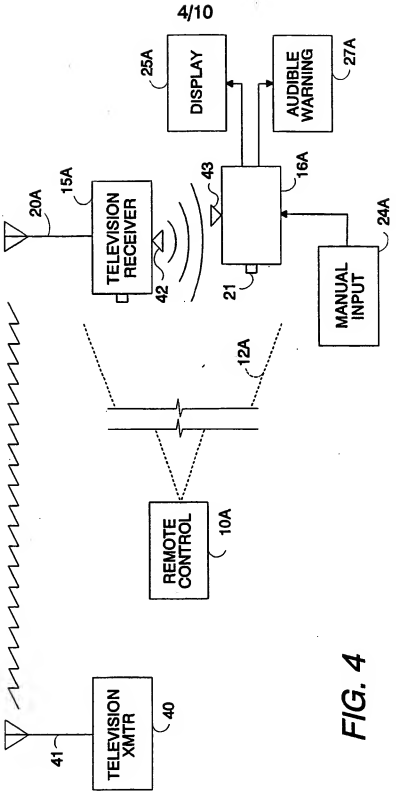

TELEVISION XMTR
40
41
REMOTE CONTROL
10A
12A
TELEVISION RECEIVER
15A
20A
42
43
21
16A
DISPLAY
25A
AUDIBLE WARNING
27A
MANUAL INPUT
24A

FIG. 4

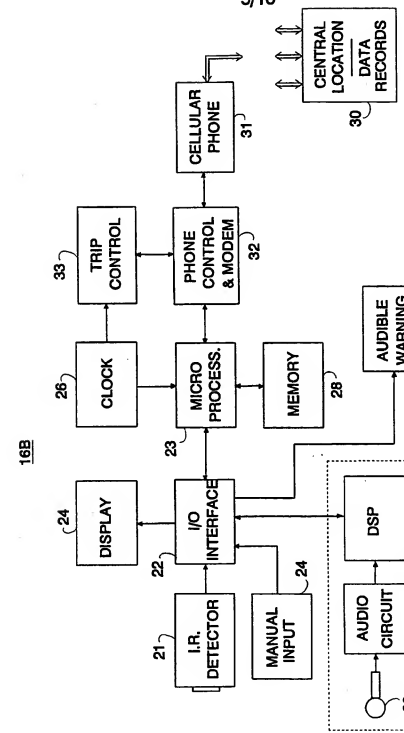

16B
I.R. DETECTOR
21
MANUAL INPUT
24
I/O INTERFACE
22
DISPLAY
24
MICRO PROCESS.
23
CLOCK
26
TRIP CONTROL
33
MEMORY
28
PHONE CONTROL & MODEM
32
CELLULAR PHONE
31
CENTRAL LOCATION DATA RECORDS
30
AUDIBLE WARNING
27
43
DSP
64
DSP MEMORY
68
AUDIO CIRCUIT
62
60
PSEUDO RANDOM SEQ'NCE
66

FIG. 5

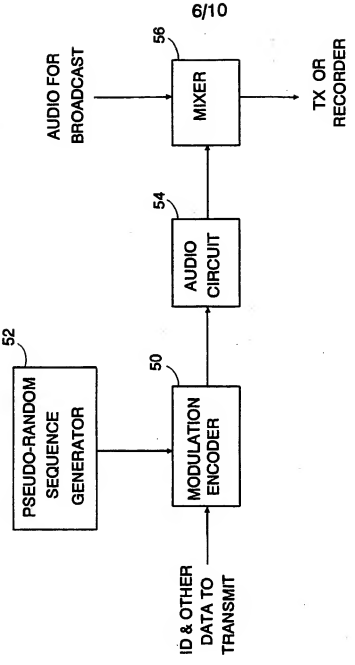

ID & OTHER DATA TO TRANSMIT
PSEUDO-RANDOM SEQUENCE GENERATOR
52
MODULATION ENCODER
50
AUDIO CIRCUIT
54
MIXER
56
AUDIO FOR BROADCAST
TX OR RECORDER

FIG. 6

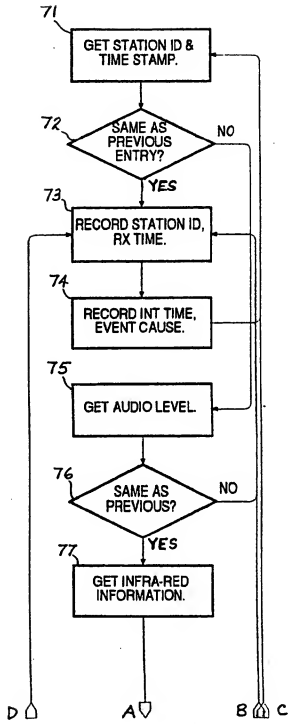

71
GET STATION ID & TIME STAMP.
72
SAME AS PREVIOUS ENTRY?
NO
YES
73
RECORD STATION ID, RX TIME.
74
RECORD INT TIME, EVENT CAUSE.
75
GET AUDIO LEVEL.
76
SAME AS PREVIOUS?
NO
YES
77
GET INFRA-RED INFORMATION.
D
A
B
C

FIG. 7A

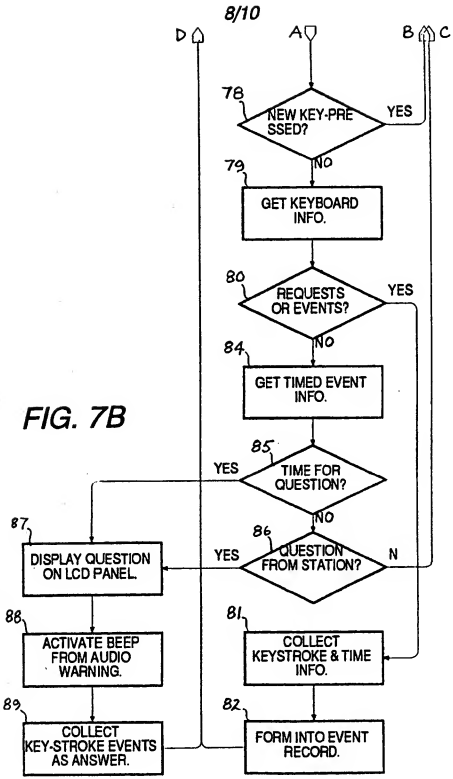

A
B
C
D
78
NEW KEY-PRESSED?
YES
NO
79
GET KEYBOARD INFO.
80
REQUESTS OR EVENTS?
YES
NO
84
GET TIMED EVENT INFO.
85
TIME FOR QUESTION?
YES
NO
86
QUESTION FROM STATION?
YES
N
87
DISPLAY QUESTION ON LCD PANEL.
88
ACTIVATE BEEP FROM AUDIO WARNING.
89
COLLECT KEY-STROKE EVENTS AS ANSWER.
81
COLLECT KEYSTROKE & TIME INFO.
82
FORM INTO EVENT RECORD.

FIG. 7B

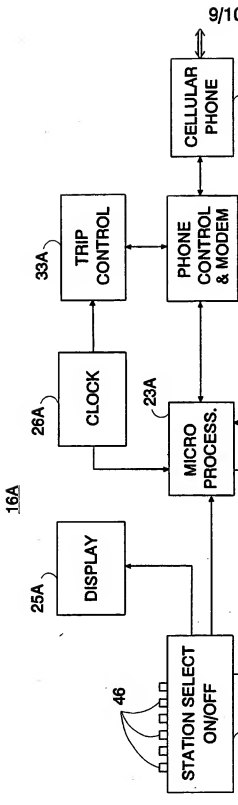

16A
STATION SELECT ON/OFF
45
46
DISPLAY
25A
AUDIBLE WARNING
27A
MICRO PROCESS.
23A
CLOCK
26A
MEMORY
28A
TRIP CONTROL
33A
PHONE CONTROL & MODEM
32A
CELLULAR PHONE
31A

FIG. 8

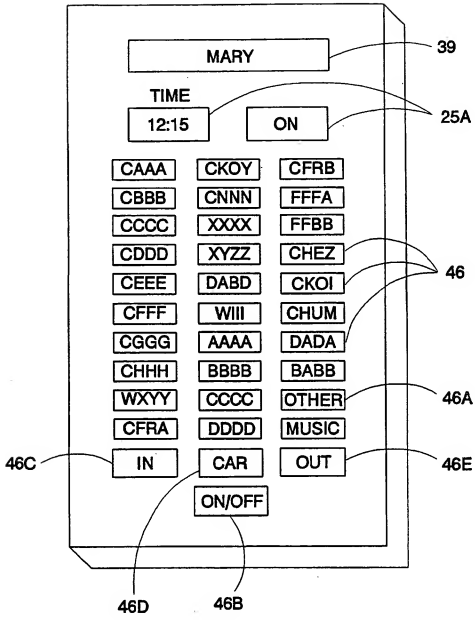

MARY
39
TIME
12:15
ON
25A
CAAA
CKOY
CFRB
CBBB
CNNN
FFFA
CCCC
XXXX
FFBB
CDDD
XYZZ
CHEZ
CEEE
DABD
CKOI
46
CFFF
WIII
CHUM
CGGG
AAAA
DADA
CHHH
BBBB
BABB
WXYY
CCCC
OTHER
46A
CFRA
DDDD
MUSIC
46C
IN
CAR
OUT
46E
ON/OFF
46D
46B

FIG. 9

INTERNATIONAL SEARCH REPORT

International Application No PCT/CA 93/00012

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 H04H9/00

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl. 5	H04H

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
Y	EP,A,0 309 326 (SGS-THOMSON MICROELECTRONICS S.A.) 29 March 1989	1
A	see column 1, line 1 - line 9; claim 2; figure 1 see column 2, line 30 - line 33 see column 3, line 27 - column 4, line 15	4,25
Y	GB,A,2 196 167 (THORN EMI PLC) 20 April 1988	1
A	see page 1, line 5 - line 63; claims 1-3; figure 1	2,4,25
A	EP,A,0 195 639 (MEWES, T. & MORGAN, G.C.) 24 September 1986 see page 1, line 1 - line 15; claims 1,9 see page 2, line 28 - page 3, line 19 see page 4, line 1 - page 5, line 23	1,2,4

-/--

* Special categories of cited documents :[10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
20 AUGUST 1993	02. 09. 93
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	DE HAAN A.J.

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	US,A,4 945 412 (KRAMER) 31 July 1990 see column 1, line 15 - line 25; claims 1,2,5-8,12-15,19-22 see column 6, line 60 - column 7, line 2	4,16,24, 25
A	US,A,5 128 933 (BARANOFF-ROSSINE) 7 July 1992 see column 1, line 1 - column 2, line 51; claims 1-10	3,4,16, 24,25
A	DE,A,1 159 524 (A.C. NIELSEN COMPANY) 19 December 1963 see column 1, line 1 - line 16; claims 1,2; figure 1 see column 6, line 14 - line 25	7,9-11, 17,29
A	DE,A,3 742 425 (GFK GMBH) 29 June 1989 see column 1, line 1 - line 35; claims 1,2; figures 1,2 see column 2, line 1 - line 42 see column 3, line 9 - line 29	8,12,20, 26,27

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.

CA 9300012
SA 69977

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 20/08/93
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-0309326	29-03-89	FR-A- 2621195	31-03-89
		DE-A- 3871885	16-07-92
		JP-A- 1115232	08-05-89
GB-A-2196167	20-04-88	None	
EP-A-0195639	24-09-86	JP-A- 61269596	28-11-86
US-A-4945412	31-07-90	US-A- 4931871	05-06-90
		AU-A- 3635189	04-01-90
		EP-A- 0347401	20-12-89
		JP-A- 2065330	06-03-90
US-A-5128933	07-07-92	None	
DE-A-1159524		None	
DE-A-3742425	29-06-89	None	